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ABSTRACT

Stressing the importance of the relationship of vocational and technical education to the economy, this paper discusses how existing educational research and development (R&D) resources can assist in preparing for the computer literate, high technology, information society. After emphasizing the magnitude of the education and training industry, the paper explains that in the 1970's, educational institutions began adopting the concept of strategic planning to meet changing external demands. The next section examines the current transformation from a material-producing to an information-producing society, citing the impact of computerization on business and post-secondary education. Next, the components of the R&D dissemination network useful to occupational education is examined. A model is then presented for utilizing R&D products in strategic planning and human resource development (HRD). Important elements of strategic planning are identified as assessing opportunities and threats in the external environment, auditing the strengths and weaknesses of the organization's internal environment, and matching strengths with opportunities. Finally, the use of R&D products in pursuing the strategic options of improving program quality, meeting the needs of the new student clientele, participating in economic development and technology transfer, and undertaking comprehensive planning is emphasized, and examples are provided. Charts illustrating the paper's major points and a list of resources are included. (DAB)

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UTILIZING RESEARCH AND DEVELOPMENT PRODUCTS IN STRATEGIC PLANNING AND HUMAN RESOURCE DEVELOPMENT IN THE COMPUTER LITERATE, HIGH TECHNOLOGY, INFORMATION SOCIETY

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ABSTRACT

The history of the development of human society can be traced from the hunting society through the agricultural society to the industrial society. During recent years we have experienced the onset of a transformation to a new type of society. Masuda indicates:

> Mankind is now entering a period of transformation from an industrial society to an information society.... Man is now standing at the threshold of a period of innovation in a new societal technology based on the combination of computer and communications technology, quite unlike any of the past. Its substance is information, which is invisible. This new societal technology will bring about societal transformation which, in a double sense, is unprecedented.

This transformation to the information society is concerned with the shift from physical productivity of material goods to information productivity and can be expected to bring about fundamental changes in human values, in trends of thought, and in the political and economic structures of society. This learning and information society will be characterized as interactions between people and ideas and knowledge.

Numerous issues will be important in the 1980's. No issue, however, will be as important as the relationship of education to the economy. Federal legislation in 1954 and 1963 created a series of research and development centers for education and, in 1965, a series of regional educational laboratories. These were followed by a series of Educational Resource Information Centers. In addition, information sources useful to occupational education include the National Training Information Service and the more than 200 Federal R & D laboratories and centers representing 11 Federal agencies in the Federal Laboratory Center, the Office of Technology Assessment of the United States Congress, and the Congressional Clearinghouse of the Future. These centers, and others like them, represent tools to assist education take a proactive leadership role in the changing nature of society. This paper will describe these tools and discuss how they can help education prepare for the computer literate, high technology, information society.

MUTUALITY OF INTERESTS

> There was a time when many institutions of higher education were regarded as enclaves within their surrounding communities. Although the walls around campuses were less formidable than those of prisons, they symbolized a purposeful separation of the worlds of formal learning and ordinary living. Town-and gown relationships were frequently characterized by hostility on the one side and aloofness on the other. With the growth of higher education's importance to society, this relationship in most places, fortunately, has undergone a marked change. Unfortunately, however, the mutuality of interests is still not widely understood and as fully appreciated as it ought to be.

* * * * * * * * * * * * * * * *

Shortly after I began to work on my presentation, I was reminded of the minister who had been reassigned to a parish in Texas. Because he wanted to impress the congregation, he pulled his best sermon from his files. Only one parishioner, a cowboy, appeared in church on Sunday. The minister preached the entire sermon. After church the minister asked the cowboy how he liked the sermon. The cowboy responded, "You know Reverend, each night I take a load of fodder down to the watering hole to feed the cattle. If only one cow shows up, however, I don't give her the whole load."

After spending some time on the presentation, and not wanting to give you the entire load, I settled on the following limited, but achievable objectives:

1. To describe briefly the magnitude of the education and training industry,
2. To explain the maturation of planning processes,
3. To examine the changing nature of society,
4. To discuss several components of the research and development - dissemination network useful to occupational education, and
5. To present a model for utilizing R & D products in strategic planning and human resource development.

Education is a Major U.S. Industry

A publication by the Association Council for Policy Analysis and Research characterizes higher education as a major U.S. industry. It states:

> Higher education is a major industry. In 1980-81, it served over 12 million individuals in part-time and full-time academic programs on over 3,000 college and university campuses. Through off-campus extension, non-credit continuing education, and community service programs, higher education reaches another 20 million people. Universities and colleges perform more than 50 percent of the basic research and 15 percent of the applied research conducted in the United States.
>
> Colleges and universities employ nearly 1.9 million people; 793,000 faculty, 280,000 managerial personnel, and 791,000 non-professional staff. Higher education employs one-quarter of the nation's scientists and engineers.
>
> Higher education makes dollar outlays for current operations of approximately $50 billion annually. This is equivalent to agriculture's contribution to the gross national product and is equal to that of the communications industry, the auto industry or the petroleum-processing industry. In many communities, higher education is the largest single employer and the biggest consumer of local goods and services.

While these statistics are impressive, these data represent only one sector of the education industry. Other sectors include public and private elementary and secondary education; propriety education and training; and other postsecondary education providers including business and industry, defense, government, and professional societies. Several characteristics of the industry are worth noting. First, the industry is not evenly distributed nor will it be in the near future. For example, the number of high school graduates between 1979 to 1995 will change from a decrease of almost 60% in Washington D.C. to an increase of almost 60% in Utah. Second, education providers respond to a diversity of needs creating a range of purposes and perceptions including "education as a consumer product" as well as "education as an investment product." The American society tends to view education as a consumer product while business and industry, for the most part, tends to view education as an investment product.

The Maturation of Mission Priorities and Planning Processes

During the post World War II years mission priorities had a focus on acquiring resources and facilities for the increased number of students resulting from the equal right demand for access to postsecondary education and limited research to support selected purposes of the industrial society. Planning in postsecondary education during the 1960s was undertaken in response to immediate needs of the instruction and research mission priorities with minimum regard to the long-term future.

During the 1970s the influx of traditional 18 to 22 year old students began to stabilize. In addition, research and development underwent significant change. Reports by the Organization for Economic Cooperation and Development,[2] the National Commission on Research,[3] and the National Science Board[4] trace the shift toward "socially relevant research", the democratization of university decision making and the accompanying "bureaueratization of university research", the rapid deterioration and growing obsolescence of laboratory equipment, and the aging of research faculty and lower morale of junior faculty. Additionally, business and industry had to shift to defensive R & D with 2 to 3 year payoffs, leaving much of the large scale "industrialized" basic research to the government.

Postsecondary education began to experience the impact of a broad range of demographic, social, economic, and political forces. As a result, organizations such as The Council of Independent Colleges (formerly The Council for the Advancement of Small Colleges), the Academy for Educational Development, and the American Association of Stage Colleges and Universities launched programs relating to comprehensive institutional planning. These projects, and others like them, all stressed the need to assess the external environment. The literature began to reflect descriptions of institutional planning processes including some way to assess the external environment.[5]

During this period of time, phenomenal growth occurred for a broad range of education and training providers including business and industry, the

department of defense, professional associations, adult education associations, and proprietary organizations. The National Conference Board, for example, indicated that in the single recession year of 1975 this nation's 7,500 largest private employers spent over $2 billion on employee education or as much as the recent annual totals of all contributions from all sources to colleges and universities.[6] In 1979, an article in The New York Times stated, "The American Telephone and Telegraph company spent $700 million on educational programs for its employees, or more than three times the $213 million annual budget of the Massachusetts Institute of Technology."[7] An article in the May 1980 issue of the Training and Development Journal stated, "Industry spends on employee education more than six times the amount appropriated by all the states for all of higher education."[8] In 1981, an article in The New York Times stated,"Within a short drive of Boston, a city with no shortage of higher education, are four new degree-granting programs that are not even affiliated with a college or university. They are sponsored by a hospital, a bank, a consulting firm, and a computer manufacturer."[9]

The slowdown in productivity caused state-level planners to reexamine the role of education in economic revitalization. Thus, the decline in the number of traditional 18 to 22 year old students, the intrusion of a broader range of education and training providers and a significant change in the research partnership has resulted in a focus on the community service and continuing education mission priorities. Institutional planning processes began to embrace the strategic concept. Strategic planning is, essentially, a way to match an organization's resources to a changing environment. It requires a way to develop a conceptual framework about the changing nature of society, audit the strengths of the institution, and match institutional strengths with opportunities in the external environment.

Conceptual Framework About Society

The history of the development of human society can be traced from the hunting society through the agricultural society to the industrial society. In the hunting society, mankind was concerned primarily with extracting things from nature. The transformation to the agricultural society was slow and based on rather simple technological innovation. The hunting and agriculture societies can be characterized as interactions between people and nature. In comparison, the transformation from the agricultural society to the industrial society occurred more quickly and was the result of technological advances in energy, transportation, communications, raw materials, and research and development networks. The industrial society can be characterized as interactions between people and goods or fabricated nature. More recently, advances in the industrial society have been the result of the integration of macro technological systems, the aggregation of complex technological developments in each of the above mentioned networks.

During recent years we have experienced the onset of a transformation to a new type of society. Masuda indicates:

> Mankind is now entering a period of transformation from an industrial society to an information society.... Man is now standing at the threshold of a period of innovation in a new societal technology based on the combination of computer and communications technology. This is a completely new type of societal technology, quite unlike any of the past. Its substance is information, which is invisible. This new societal technology will bring about societal transformation which, in a double sense, is unprecedented.[10]

This transformation to the information society is concerned with the shift from physical productivity of material goods to information productivity and can be expected to bring about fundamental changes in human values, in trends of thought, and in the political and economic structures of society. This learning and information society will be characterized as interactions between people and ideas and knowledge.

Masuda describes four developmental stages of computerization based on the use of computers at the levels of (1) big science, (2) management, (3) society, and (4) the individual.[11] The big science stage took place in the period between around 1945 and 1970 and had a focus on "the state" making extensive use of the computer in large scale projects such as national defense and space exploration. The second stage of computerization had a focus on management-based computerization in both government and business and took place from around 1955 to about 1980. In about 1970 computerization advanced into the third stage, society-based computerization, in which the computer will be used for the benefit of society as a whole. In about 1975 computerization entered its fourth stage of individual-based computers, the beginning of the high mass knowledge creation society. Masuda indicates "that these four stages can not be a series of mere successive developments, but each stage will continue developing even while the succeeding stage is coming into being."

Computers will impact on every sector of our society. In the field of engineering, for example, increasing competition in world markets has made manufacturers realize that they must do more with less, and do it better. Many manufacturers feel that an investment in technology will help them become more effective and efficient in what they do. Technological advances have been made in the design, engineering and manufacturing processes through Computer Aided Design (CAD), Computer Aided Engineering (CAE), and Computer Aided Manufacturing (CAM). Other terms used to describe technological advances include Group Technology, Manufacturing Planning and Control Systems, Automated Materials Handling, Materials Requirements Planning (MRP), scheduling approaches such as Automated Time Standards (ATS), Computer Assisted Process Planning, and Manufacturing Resources Planning (MRPII). When these technological advances are combined in an effort to move toward the "Factory of the Future," the combination is referred to as Computer Integrated Manufacturing or Integrated Computer Aided Manufacturing.

Similar changes are occurring in business extending from market research through consumer satisfaction and in health care extending from health promotion through tertiary, long-term, extended care. A good example which can be applied to most fields is the concept of inventory. Inventory could mean (1) raw materials to make components, (2) components to make products, or (3) distribution of products to meet consumer demands. The acquisition, storing, retrieving, and redistribution of inventory is costly to any industry, particularly the educational and information industries. Inventory, be it raw physical materials or data, is undergoing rapid change due to computerization.

Implications for postsecondary education are apparent. Colleges and universities need some way to monitor demographic, social, economic, and governmental planning forces in society to develop visions and scenarios of possible alternative futures for their institution.[12] Tools for doing this include (1) needs assessment, (2) market analysis,[13] (3) environmental scanning, (4) trend analysis,[14] (5) policy analysis, and (6) issues management.[15] Visions and scenarios should be based on hard data about the college and its service area. The analysis should attempt to match institutional strengths and weaknesses with opportunities in the external environment. Bowen suggests four options for postsecondary education: (1) redirect resources toward higher quality, (2) redirect resources toward research and public service, (3) redirect resources toward new student clientele, and (4) retrenchment.[16] The above-described computer literate, high technology, information society suggests there are numerous institutional goals that can be derived from such a scenario. Leslie suggests a framework and a course of action for postsecondary institutions as they progress through various phases of the computerized, technological, "Third Wave" society.[17] Postsecondary education institutions and systems need some way to monitor changes in society to develop the most likely scenario of its future and then translate that scenario into specific goals and objectives to which resources can be allocated.

The Research and Development Network and Dissemination

Federal legislation in 1954 and 1963 created a series of nine research and development centers to engage in R & D in education. In 1965, P.L. 89-10 created a network of twenty regional educational laboratories to translate the results of this R and D into products that could be used in education and training. Although the number of such laboratories has been reduced to seventeen over the years, the primary function of this system continues to focus on the generation of new knowledge and the reduction of the lag between R & D and its dissemination and adoption. This system is coordinated, to some extent, through the Council for Educational Development and Research. (See Appendix A for a list CEDaR-Member Institutions)

Another tool which has evolved over time is the system of Educational Resource Information Centers (ERIC). ERIC is a system of seventeen clearinghouses which are repositories of documents ranging from pure through applied R & D for a variety of areas such as adult, career, and vocational education; counseling and personnel services; educational management; higher education; information resources; junior colleges; reading and communications skills; and other topics. An example of the value of these tools is apparent in the Spring 1982 issue of the ERIC Junior College Resource Review entitled "Literacy In Community College." To what extent do we utilize the inventory of tools to improve different types of literacy and the quality of the education and training industry? (See Appendix B for a list of ERIC Clearinghouses)

In addition, information sources useful to occupational education include the National Training Information Service and the more than 200 Federal R & D laboratories and centers representing 11 Federal agencies in the Federal Laboratory Center (See FIGURE 1),[18] the Office of Technology Assessment (See Appendix D),[19] and the Congressional Clearinghouse of the Future.[20]

FIGURE 1

FEDERAL LABORATORY CONSORTIUM

Utilizing R & D Products in Strategic Planning and HRD

Strategic planning and management is, essentially, a way to match an organization's strengths to opportunities in a changing environment. It requires a capability to (1) assess opportunities and threats in the organization's external environment, (2) audit the strengths and weaknesses in its internal environment, and (3) match its strengths with opportunities. The outcome of strategic planning and management is to capitalize on strengths, minimize weaknesses, take advantage of opportunities, and eliminate or reduce threats.

1. Assessing the External Environment.

Because of anticipation of unprecendented change in societal trends and values in the 1980s, the Resource Center for Planned Change of the American Association of State Colleges and Universities developed A Futures Creating Paradigm as a way of planning futures and bringing planning assumptions into focus.[21] The project uses a cross-influence matrix of 12 societal trends and 12 values to determine goals in 10 areas. The 12 societal trends are population, government, global affairs, environment, energy, economy, science and technology, human settlements, work life style, women and participation. The 12 societal values are change, freedom, equality, leisure, foresight, pluralism, localism, responsibility, knowledge, quality, goals, and interdependence. The 10 goal areas are finance, students, research and development, public service, facilities, faculty, curricula, administration, resources, and athletics. This format was used in one product of The National Center for Research in Vocational Education.[22] The model is extremely complex and time consuming.

The point that is central to this discussion is that strategic planning and management must include a critical analysis of forces and trends which are essentially external to the organization. Data processing and management information systems in the past have tended to focus on data elements relating

to internal operations of the institution such as registration, scheduling, class rosters, space utilization, grade reporting, student aid, payroll, budgeting and other administrative applications. Although the processing of data elements which are essentially internal to the institution will continue to be an important factor in decision making, organizational strategic planning processes are becoming increasingly more dependent upon data elements external to the institution. Categories of data and information could include demographic trends, economic trends, social indicators, governmental planning including legislation and investment in R & D, technological advances, changes in the workplace, energy requirements, and value shifts. The critical analysis of forces and trends should be firmly based on hard data in so far as possible.

Aggregate categories of data about the external environment include (1) demotrends, (2) economic trends, (3) social indicators, (4) governmental planning, (5) technological advances, (6) changes in the workplace, (7) energy requirements, and (8) value shifts. Sample subcategories for the first three of the above-mentioned groupings are displayed in FIGURE 2. Institutions and statewide systems need some way to structure data and information about the external environment.

Before launching any effort to gather great quantities of data about an institution's external environment, however, consideration should be given to the total planning, management, and evaluation cycle. Numerous products and tools of The National Center for Research in Vocational Education and The National Center for Higher Education Management Systems are of great value in looking at the full range of things that should be considered from preplanning through reporting on outcomes, both output of the institution and impact on a range of dimensions. The literature is becoming more extensive with regard to strategic planning and trend information. A listing of these products and tools can be found in Appendices C, D, and E.

FIGURE 2

SAMPLE SUB-CATEGORIES FOR SUGGESTED DATA CATEGORIES

EXTERNAL ENVIRONMENT		
DEMOGRAPHIC CHARACTERISTICS	ECONOMIC TRENDS	SOCIAL INDICATORS
Population Size	Textile Industry	Population & The Family
Age Distribution	Auto Industry	Health & Nutrition
Sex Ratio	Electronics Industry	Housing & The Environment
Marital Status	Telecommunications Industry	Transportation
Ethnic and Cultural Characteristics	Health Care Industry	Public Safety
Education Levels	Agriculture Industry	Education & Training
Economic Status	Airline Industry	Work
Population Density	Energy Industry	Social Security & Welfare
Degree of Urbanization	Steel Industry	Income & Productivity
Racial Composition	Insurance Industry	Social Participation
Unemployment	Shipbuilding Industry	Culture, Leisure & Use of Time
Poverty & Deprivation	Biotechnology Industry	
Illiteracy	Aerospace/Space Industry	
Existance of Basic Community Services	Defense Industry	
	Synfuel Industry	
Social, Political, Economic Well Being	Mining Industry	
	Education Industry	

2. Audit of Internal Environment

An institution or system can be viewed as being comprised of several areas such as (1) planning, research, and evaluation; (2) enrollment, retention, and financial aid; (3) primary certificate, degree, and diploma programs; (4) support programs; (5) personnel management and development; (6) fiscal resources development and management; and (7) reporting and outcomes analysis.

Each of the above-listed areas is an aggregate of functions within the institution. For example, "planning, research, and evaluation" consists of (1) the capability for external environment assessment, (2) the institutional planning process, (3) institutional research, (4) management information system, (5) institutional self-studies, and (6) the annual evaluation process. As was indicated in the previous section, external environment assessment is a function, for the most part, of an institution's capacity to use the tools of (a) needs assessment, (b) market analysis, (c) trend analysis, and (d) environmental scanning. This type of detail can yield an evaluation format for diagnosing stage of institutional development. By adding scale and more specific criteria, an institution can diagnose with some degree of accuracy the stage of institution or system development. A model evaluation format is displayed in FIGURE 3.

Because most of an institution's resources are in direct support of certificate, degree, and diploma programs, evaluation of them deserves special attention. Primary programs can be evaluated on the basis of quality, centrality, and market viability. Quality is a function of faculty, students, library holdings, support services, program characteristics, program advisory committees, and other variables. Market viability is defined as demand in the marketplace, competition, and comparative advantage. The external environment assessment provides insights into market viability dimensions. Several tools are available to evaluate programs or conduct an internal audit.[23]

FIGURE 3

EVALUATION FORMAT FOR

DIAGNOSING STAGE OF INSTITUTIONAL DEVELOPMENT

	5	4	3	2	1	0
I. Planning, Research and Evaluation						
1. External Environment						
a. Needs Assessment	___	___	___	___	___	___
b. Market Analysis	___	___	___	___	___	___
c. Trend Analysis	___	___	___	___	___	___
d. Environmental Scanning	___	___	___	___	___	___
2. Planning Process						
a. Institutional Goals	___	___	___	___	___	___
b. Specific Objectives	___	___	___	___	___	___
3. Institutional Research	___	___	___	___	___	___
4. Management Information System	___	___	___	___	___	___
5. Institutional Self-Study	___	___	___	___	___	___
6. Annual Evaluation Process	___	___	___	___	___	___
II. Enrollment, Retention, and Financial Aid						
1. Manual of operations for admissions	___	___	___	___	___	___
2. Inquiry System	___	___	___	___	___	___
3. Marketing plan	___	___	___	___	___	___
4. Communication tools	___	___	___	___	___	___
5. Professional development	___	___	___	___	___	___
6. Faculty understanding	___	___	___	___	___	___
7. Manual of operations for financial aid	___	___	___	___	___	___
8. Enrollment projections	___	___	___	___	___	___
III. Primary Programs (Certificate and Degree Programs)						
1. Accounting	___	___	___	___	___	___
2. Business Management	___	___	___	___	___	___
3. Data Processing	___	___	___	___	___	___
4. Drafting and Design	___	___	___	___	___	___
5. Electronic Engineering	___	___	___	___	___	___
6. Industrial Management	___	___	___	___	___	___
7. Law Enforcement	___	___	___	___	___	___
8. Mechanical Engineering	___	___	___	___	___	___
9. Mental Health and Retardation	___	___	___	___	___	___
10. Nursing (R.N.)	___	___	___	___	___	___
11. Practical Nursing	___	___	___	___	___	___
12. Radiologic Technology	___	___	___	___	___	___
13. Respiratory Therapy	___	___	___	___	___	___
14. Retail Management	___	___	___	___	___	___
15. Sales and Marketing	___	___	___	___	___	___
16. Secretarial Science	___	___	___	___	___	___
17. Therapeutic Recreation	___	___	___	___	___	___

	5	4	3	2	1	0
IV. Support Programs						
1. Counseling services	___	___	___	___	___	___
2. Student records	___	___	___	___	___	___
3. Placement	___	___	___	___	___	___
4. Educational Enrichment Laboratory	___	___	___	___	___	___
5. Learning Resources Center	___	___	___	___	___	___
6. Physical Activities Center	___	___	___	___	___	___
7. Student activities	___	___	___	___	___	___
8. Community Educational Services	___	___	___	___	___	___
V. Personnel Management and Development						
1. Policies/practices	___	___	___	___	___	___
2. Institution organization	___	___	___	___	___	___
3. Professional development	___	___	___	___	___	___
4. Management development	___	___	___	___	___	___
5. Interpersonal skills	___	___	___	___	___	___
6. Sense of community	___	___	___	___	___	___
7. Staff management	___	___	___	___	___	___
8. Institutional advisory committees	___	___	___	___	___	___
VI. Fiscal Resources Management and Development						
1. Cash flow analysis	___	___	___	___	___	___
2. Budget planning systems	___	___	___	___	___	___
3. Budget control	___	___	___	___	___	___
4. Donor cultivation	___	___	___	___	___	___
5. Planning college revenues	___	___	___	___	___	___
6. Gift record keeping system	___	___	___	___	___	___
7. Cost effectiveness	___	___	___	___	___	___
8. Proposal development/grants administration	___	___	___	___	___	___
VII. Reporting and Outcomes Analysis						
1. Internal communications mechanisms	___	___	___	___	___	___
2. External communications mechanisms	___	___	___	___	___	___
3. Output analysis system	___	___	___	___	___	___
4. Impact analysis system	___	___	___	___	___	___

KEY:

5 Outstanding, far exceeds reasonable expectations
4 Good, generally exceeds reasonable expectations
3 Satisfactory
2 Doubtful, generally falls short of reasonable expectations
1 Unsatisfactory, totally inadequate
0 Non-existant

3. Matching Strengths With Opportunities

The purpose of data gathering is to gain insights into the several options an institution will choose in charting a course of action over the next several years. The results of the external environment assessment should consist of a listing of opportunities and threats, in rank order to the extent possible. These opportunities and threats can be judged to be primarily demographic, economic, social, or political. The results of the internal audit should yield a listing of strengths and weaknesses, also in rank order to the extent possible. The matching process is intended to capitalize on strengths, minimize threats, take advantage of opportunities, and eliminate or reduce threats. Strategic options available to institutions and systems have been listed as (1) direct resources toward higher quality, (2) direct resources toward new student clientele, (3) direct resources toward public service and research, or (4) retrenchment. There are combinations which are possible.

Persons serving on institutional and program advisory committees and part-time faculty are invaluable assets in the analysis of forces, trends, and their effects upon their industry or job responsibility. These persons can (1) review raw data for accuracy, (2) review preliminary analysis of data, (3) help to specify assumptions on which to base subsequent planning, (4) assist the college to formulate specific objectives relative to strategic goal areas, and (5) evaluate progress the college is making on stated goals and objectives. In computer literacy, for example, program advisory committees can help to specify the components of competence of computer literacy based on what is required of persons in their world of work. They can provide valuable information about corporate conversion as it related to data processing in managing the establishment or a component of it. They can help to specify the continuing education programs necessary to keep corporate employees current in their field.

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Utilizing R & D Products In Strategic Planning and Human Resource Development

A comprehensive institutional or system planning process consists of the structural components and the personnel development components. The structural components include (1) the Planning/Budgeting Committee; (2) the Plan to Plan Document; (3) the mechanism for assessing the external environment; (4) the format for displaying assumptions, goals and objectives, and anticipated costs over a time-line; (5) the way an organization or system deals with integrating various units and functions such as planning, institutional research, management information, public relations, marketing, development, and reporting; and (6) the facilities and services available to support and sustain the planning/budgeting effort such as a room which is dedicated for that purpose. The personel development components include all the attitude and organizational climate variables which contribute to the human resource development aspects of the process.

Time will not permit a detailed discussion of each of these elements. The relationship between specifying assumptions, stating goals and objectives, and relating resources to them is important because it bridges both the structural components and the personnel development components. That link is extremely important. The specification of assumptions helps to clarify fuzzy images of alternative scenarios of the future and helps to sharpen the focus of goals and objectives. The derivation of goals and objectives is the creative heart of the process. Therefore, the process of specifying assumptions is to diagnosis as the derivation of goals and objectives is to development.

A not too complex an approach is to have a limited number of categories for assumptions and goals and objectives which match. For example, categories for specifying assumptions could be (1) societal context, (2) quality of life/quality of work-life issues, (3) human resource development needs, and

(4) capital planning needs. Categories for stating goals and objectives could be (1) external environment, (2) qualitative improvements, (3) human resource development, and (4) capital planning. (See FIGURE 4) An example of the use of this format using demographic data is as follows. One in four white Americans is young. One in three black Americans is young. One in two Hispanic Americans is young. Thirty-eight percent of white Americans have school age children. Sixty-six percent of Hispanic Americans have school age children. Data about the service area are interpreted into assumptions and then interpreted into specific goals and objectives under the above-mentioned categories.

R & D products can be used to gain insights about assumptions, goals and objectives, or ways to achieve specific objectives. This is particularly true when an institution or system has a clear idea of which one of several strategic options it is pursuing. Specific examples for using R & D will be cited based on the several strategic options.

1. Higher Quality.

Higher quality could be interpreted to mean simply raising the minimum acceptance level of students into a particular program. More likely alternative intrepretations would include (a) program upgrading, (b) alternative delivery system development, or (c) concentration on some new focus such as high technology which would include computer literacy. Program upgrading could be accomplished through the use of the Performance Based Teacher Education Modules and the Competency-Based Vocational Education Administrator Modules produced by The National Center for Research in Vocational Education. Other useful documents include Increasing Productivity in the Community Colleges and Staff Development in the Community College: A Handbook by the ERIC Clearinghouse for Junior Colleges and Computer Literacy in Higher Education and Organizational Communications and Higher Education by the ERIC Clearinghouse

FIGURE 4

AGGREGATE CATEGORIES OF ASSUMPTIONS AND GOALS AND OBJECTIVES

Assumptions (Essentially External)	Goals and Objectives (Essentially Internal)
A. Societal Context	A. External Environment
1. Demographic Trends	1. Needs Assessment/Market Analysis
2. Social Expectations	2. Mission Attainment
3. Economic Trends (By Industry)	3. Functional Relationships
4. Governmental Planning	4. Public Relationships
B. Quality of Life/Work Life Issues	B. Qualitative Improvements
	1. Academic Affairs
	2. Student Services
	3. Administrative Support
C. Human Resource Development Needs	C. Human Resource Development
	1. Faculty
	2. Professional Staff
	3. Administrative Support
D. Capital Planning Needs	D. Capital Planning
1. Equipment	1. Equipment
2. Physical Plant	2. Physical Plant
3. Dollars	3. Dollars

on Higher Education and published by the American Association for Higher Education. Other ERIC publications deal with cognitive style mapping and learning styles.

2. New Student Clientele.

It was indicated that change in the number of high school graduates between 1979 and 1995 will range from a decline of almost 60% to an increase of almost 60%. Eleven states will experience a decline of more than 30% in the number of high school graduates during that time. Frances lists twelve different strategies for increasing enrollment in colleges as follows:

> Increased high-school-graduation rates of students who would otherwise drop out
> Increased credentialing by testing of high school dropouts
> Increased enrollment of low- and middle-income students
> Increased enrollment of minority youths
> Increased enrollment of traditional college-age students
> Increased retention of current students
> Increased enrollment of adults
> Increased enrollment of women 20-34
> Increased enrollment of men 35-64
> Increased enrollment of graduate students
> Increased enrollment of persons currently being served by industry
> Increased enrollment of foreign students[25]

Upgrading employees, training persons for skilled worker shortage areas,[26] and retraining persons because of economic dislocations[27] present unique challenges to vocational and technical education. The strategic decision to provide services for new student clientele carries with it the mandate for restructuring our organizations. ERIC documents such as Experiential Learning in the Community Colleges and ERIC searches on special populations are of great value in this area. (See Appendix G for a bibliography on human resource development.)

3. Public Service and Research

Foreign competition, technological advances, changes in productivity, high costs, plant obsolescence, and infrastructure deterioration are causing major dislocations in our economy. Helping entrepreneurs and business and industry is essential for vocational and technical education. Research indicates that

80% of the new jobs are created by establishments no more than four years of age and with 20 or fewer employees.[28] Research also indicates that most entrepreneurs started their companies when they were 25 to 40; many are highly educated with 36% having 16 or more years of schooling; and about 50% had entrepreneural parents.[29] In addition, research by Cooper indicates that the most important dimensions leading to new product success are (1) product uniqueness and superiority, (2) market knowledge and marketing proficiency, and (3) technical and production synergy and proficiency.[30] Sharing Resources,[31] and ERIC Update on Entrepreneurship,[32] and the Postsecondary Alliance Business and Industry Needs Assessment Model[33] help to provide direction for efforts to assist business and industry.

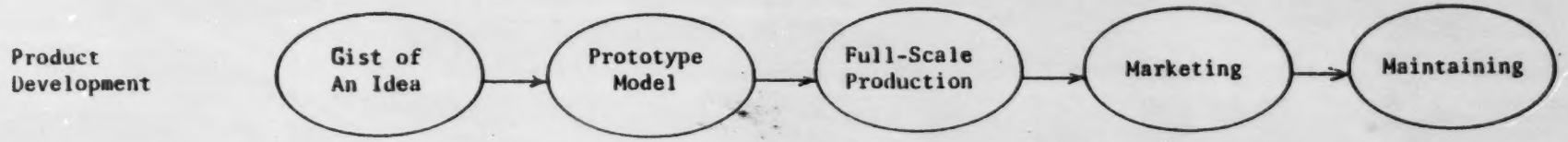
The National Center for Research in Vocational Education is conducting a project to help community and technical colleges be more effective agents for economic development in their communities through upgrading and retraining of adult workers. A guidebook will be developed containing case studies of five colleges' involvement in economic development, including their structures and processes for doing so; identification of barriers and solutions in providing customized training for industry; and critical elements for success in these economic development activities.[34]

Technology Transfer occurs in varied ways in different societies. Regardless of the way Technology Transfer occurs, however, it requires the integration of information about (1) the R & D cycle, (2) the new product development cycle, and (3) stage of organizational development. The R & D cycle consists of problem formulation and research, development, demonstration, and dissemination. The new product development cycle includes the gist of the idea, prototype model, full-scale production, marketing, and maintaining. Stages of organizational development can be described as emergence, growth, maturity, regeneration, and decline. These three sets of data must be integrated to meaningfully reduce the lag in Technology Transfer. (See FIGURE 5)

FIGURE 5

RESEARCH AND DEVELOPMENT CYCLE

NEW PRODUCT DEVELOPMENT CYCLE



STAGE OF ORGANIZATIONAL DEVELOPMENT

The comprehensive institutional or system-wide planning model then begins with the systematic collection and analysis of data about its external and internal environment. These data are interpreted into assumptions about future conditions which form the foundations for goals and objectives. Assumptions and goals and objectives can be organized on the basis of a system of categories such as those in FIGURE 4. An example of specific objectives relative to pursuing functional relations with business and industry is as follows:

(a) To host several meetings for representatives from business and industry.

(b) To support activities of the local chapter of the American Society for Training and Development (ASTD).

(c) To expand the number of calls on business and industry.

(d) To continue "on-site" classes in response to identified needs.

(e) To make better use of Program and Placement Advisory Committees.

(f) To develop and maintain "targeted" mailing lists.

To such objectives, human and fiscal resources can then be dedicated.

No discussion on comprehensive planning would be complete without some comment on integration. Integration should occur between disciplines, among institutional functions, and among institutions within a system. Integration must occur both horizontally and vertically. An example of integration between disciplines would be between rehabilitative counseling and engineering robotics to help accomplish equal opportunity objectives either in education or the workplace. Horizontal integration at the institutional level involves synchronization of strategic planning with operational planning and coordination with institutional research, the management information system, public relations and alumni affairs, marketing, development and fund raising, and other functions. Vertical integration includes top down and bottom up interdigitation. A recent survey by The Association of Institutional Research

suggests that an activity in offices of institutional research is dedicated to institutional planning. (See FIGURE 6).

Throughout this discussion reference has been made to the personnel development components of the planning and management process. Professional preparation and professional continuing education is an extraordinarily complex task today. Most faculty were graduated from undergraduate and graduate programs which focused on service delivery as opposed to educator roles. Their programs tended to concentrate on competence in relationship to performance of a role other than learning facilitator. Their programs dealt minimally, if at all, with curriculum content formats, packaging formats, or learning outcomes evaluation formats. Nor did they concentrate on stages of adult development and distinctions between pedagogical and andrologogical principles. Just as it is important for elementary school teachers to understand principles of human growth and development for the relatively homogeneous populations they serve, so too is it important for the professional educators in postsecondary education to understand the increasingly heterogeneous populations they serve.

Dimensions of the magnitude of the heterogeneous nature of the human resource development challenge is receiving more attention. Numerous articles have been written in recent years about the growing number of functionally imcompetent,[35] scientific illiterate,[36] and the growing illiteracy problem for business when employees lack reading and writing skills necessary for their work.[37] An article in the Boston Sunday Globe indicated that it is scandalous that Johnny and Janie cannot write when they enter college "but it is perhaps less scandalous than the possibility that, when they emerge as bachelors of arts or science, they may be unable to describe either discipline in acceptable written English."[38] The problem is compounded when to these forms of illiteracy are added (1) occupational illiteracy, (2) economic illiteracy, (3) research illiteracy, (4) management systems illiteracy,

FIGURE 6

MOST FREQUENT AREAS OF INSTITUTIONAL RESEARCH ACTIVITY

NOTED BY AIR MEMBERS EMPLOYED IN OFFICES OF

INSTITUTIONAL RESEARCH AND IN OTHER ORGANIZATIONAL SETTINGS

Institutional Research Activities	Total (N = 674)		Institutional Research Offices (N = 295)		Other Offices/ Settings (N = 379)	
	N	Rank	N	Rank	N	Rank
Developing enrollment projections	406	1	210	2	196	3.5
Support of institutional-level planning processes	404	2	200	3	204	1
Analyzing student retention/attrition	400	3	215	1	185	9
Analyses of instructional program credit hour costs	388	4	197	5	191	5.5
Management information systems	386	5	190	7	196	3.5
Use of statistical packages for planning and analyses	377	6	189	8	188	8
Goal setting	357	7	167	11.5	190	7
Meeting external reporting needs	349	8.5	182	9	167	13
Fact book development	349	8.5	198	4	151	17
Implementation of planning processes	344	10	142	27	202	2
Data base development/management and control	342	11	160	13	182	10.5
Institutional self-study/accreditation	340	12	194	6	146	-
Faculty workload analysis	327	13	167	11.5	160	14
Analyses of revenue and expenditure patterns	315	14	133	24	182	10.5
Analyses of salaries/fringe benefits	310	16	156	17	154	15
Analysis of planning strategies and political approaches	310	16	119	-	191	5.5
Analyses of resource utilization	310	16	131	25.5	179	12
Follow-up surveys of graduates	309	18	179	10	130	-
Reporting of space utilization and inventory data	299	19	155	18.5	144	19.5
Space utilization cost studies	289	20	151	21	138	22.5
Development of student credit hour projections	284	22	155	18.5	129	-
Development/Adaptation of planning models to institutional environments	279	23	126	-	153	16
Analyses of administrative and departmental support costs	268	24.5	131	25.5	137	24
Analyses of grading trends, policies, grade inflation	268	24.5	158	14	110	-
Interinstitutional data exchanges	267	26	137	23	130	-

SOURCE: AIR Newsletter (Summer 1982) p. 3.

(5) information processing illiteracy, and (6) technologic illiteracy. Human resource development, the prevention of human obsolescence, is the biggest challenge to this nation in the years ahead.

In Career Dynamics: Matching Individual and Organizational Needs, Schein presents a "career development perspective."[39] The essence of his career development perspective is a focus of the indivudual and the organization over time. The perspective has a focus on organizational issues as the establishment passes through various stages of evolution and on individual issues as the person passes through various stages of growth and development such as career choice, early career issues, mid career issues, and late career issues. The challenge to vocational and technical education is to understand how that occurs in the world of work as well as in their own lives in their world of education.

For example, "high technology" is a buzz word that is currently in vogue. "High technology" could be defined as any influence of the computer on (1) engineering and design, (2) planning and scheduling, (3) fabrication and assembly, and (4) marketing and distribution. Such a definition seems most appropriate to the manufacturing of durable goods. In the education industry, telematics seems more appropriate. Telematics is a collective term for telecommunication, computer, and information technologies. (See Appendix H). The definition of high technology for vocational and technical education must therefore be generic enough to embrace a definition of high technology for business and industry but also the way it conducts its own affairs, the delivery of education and training services. While some progress has been made in the electronic delivery of education and training,[40] the education industry is remarkedly resistant to the use of high technology to diagnosing learner stages of development, the delivery of instruction, or the evaluation of outcomes. If vocational and technical education champions "high technology,"

should it not define the term and chart a course of action for both the organization and individuals within the organization? It would appear incontrovertible that maximum synergism is achieved when individual diagnostic/development systems are in harmony and synchronization with the organization planning/development system.

Conclusion

Numerous issues will be important in the 1980s. No issue will be more important, however, than the relationship of vocational and technical education to the economy. The story of America's deterioriating infrastructure is all too familiar by now. There were 17,044 business failures in 1981, a 45% increase from the 11,742 in 1980. There were 11,950 business failures in the first six months of 1982.[41] Dale Parnell, President of the American Association of Community and Junior Colleges, states the challenge in the following way:

> At a time when unemployment lines are lengthening, when there is a severe shortage of skilled workers, and when we are experiencing greatly accelerating technological changes, this country simply must retrain millions of people whose current jobs are vanishing. Retraining and continuing education for new jobs will be a key to economic survival of this nation.[42]

In the past, occupational education saw its relationship to the economy primarily in terms of providing a trained workforce. This focus will continue to be important in the future but not sufficient. New expanded relationships will be required between postsecondary education and the economy in the computer literate, high technology, information society when the "paperless office" and the "automated factory" become an operational reality. Gollattscheck and others indicate the time has come for the development of community colleges as community renewal institutions. They state:

> We believe the time has come for a fourth major development in American postsecondary education: the creation of the community renewal college. The deterioration of our communities, the increasing inability of individuals to cope with rapid change, the obsolescence of

> individuals and social organizations, and the increasing number of citizens with educational needs who are beyond the purview of existing colleges demand a new kind of postsecondary institution. This new college must be committed to the improvement of all aspects of community life....[43]

R & D has provided vocational and technical education with the tools to make our institutions instruments of economic and social change. Are we willing to dedicate our institutions to use these tools to the improvement in the quality of community and work life?

CEDaR

COUNCIL FOR EDUCATIONAL DEVELOPMENT AND RESEARCH

The primary mission of the CEDaR-member institutions is to promote school improvement through their research, development, dissemination, and service activities. Each member produces new r&d knowledge; develops processes and products; provides direct, r&d-based services to schools; and works with intermediate groups, agencies, and institutions.

The member institutions consist of eight university-based research and development centers and ten nonprofit, educational r&d agencies. The charter members of CEDaR, the regional educational laboratories and the university-based centers, were created by federal legislation in the '60s.

Today these 18 institutions receive more than $50 million annually in federal funds to work for school improvement. Most of these federal funds come from contracts and grants with the National Institute of Education and the U.S. Office of Education. Other federal agencies, as well as state and local agencies, provide additional support.

Individually and collectively the CEDaR members stand ready to lend their research and development expertise to state, intermediate, and local education agencies.

The CEDaR members have expertise in such areas as:

- adult/family education
- basic skills
- bilingual/multicultural education
- career education
- desegregation
- early childhood education
- equity
- personnel training
- regional services
- school finance
- school organization
- special education
- student assessment/testing
- student behavior
- teacher effectiveness

Additional information about the work of the CEDaR members may be obtained either directly from the institutions, listed on the reverse, or through their national association, CEDaR.

CEDaR's quarterly publication, *Educational R&D Report*, presents to a nation-wide audience of educators in-depth articles and brief summaries of the results of federally funded educational research and development. The publication is available free of charge from CEDaR.

COUNCIL FOR EDUCATIONAL
DEVELOPMENT AND RESEARCH
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202/638-3193

APPENDIX A

CEDaR-Member Institutions

Appalachia Educational Laboratory
Terry L. Eidell, Executive Director
Post Office Box 1348
Charleston, West Virginia 25325
304/344-8371

CEMREL, Inc.
Wade Robinson, President
3120 59th Street
St. Louis, Missouri 63139
314/781-2900

Center for Educational Policy and Management
Robert H. Mattson, Director
College of Education
University of Oregon
Eugene, Oregon 97401
603/686-5173

Center for Social Organization of Schools
Edward McDill, Co-director
James McPartland, Co-director
Johns Hopkins University
3505 North Charles Street
Baltimore, Maryland 21218
301/366-3582

Center for the Study of Evaluation
Eva L. Baker, Director
UCLA Graduate School of Education
145 Moore Hall
Los Angeles, California 90024
213/825-4711

Far West Laboratory for Educational Research and Development
John K. Hemphill, Executive Director
1855 Folsom Street
San Francisco, California 94103
415/565-3000

Institute for Research on Educational Finance and Governance
Henry M. Levin, Director
School of Education
Stanford University
Stanford, California 94305
415/497-0840

Learning Research and Development Center
Robert Glaser, Co-director
Lauren Resnick, Co-director
University of Pittsburgh
3939 O'Hara Street
Pittsburgh, Pennsylvania 15260
412/624-4800

Mid-continent Regional Educational Laboratory
Lochran C. Nixon, Jr., Executive Director
7302 Pennsylvania Avenue
Kansas City, Missouri 64114
816/361-7700

National Center for Research in Vocational Education
Robert E. Taylor, Director
Ohio State University
1960 Kenny Road
Columbus, Ohio 43210
614/486-3655

The Network
David P. Crandall, Executive Director
290 South Main Street
Andover, Massachusetts 01810
617/470-1080

Northwest Regional Educational Laboratory
Lawrence D. Fish, Executive Director
710 S.W. Second Avenue
Portland, Oregon 97204
503/248-6800

Research for Better Schools
John E. Hopkins, Acting Executive Director
444 North Third Street
Philadelphia, Pennsylvania 19123
213/574-9300

Research and Development Center for Teacher Education
Oliver H. Bown, Director
University of Texas at Austin
Education Annex 3.203
Austin, Texas 78712
512/471-1343

Southwest Educational Development Laboratory
James H. Perry, Executive Director
211 East Seventh Street
Austin, Texas 78701
512/471-6861

SWRL Educational Research and Development
Richard E. Schutz, Director
4665 Lampson Avenue
Los Alamitos, California 90720
213/598-7661

Wisconsin Research and Development Center for Individualized Schooling
Wayne Otto, Co-director
Richard A. Rossmiller, Co-director
1025 West Johnson Street
Madison, Wisconsin 53706
608/263-4200

APPENDIX B
- ERIC CLEARINGHOUSES

ERIC Clearinghouse on Adult, Career, and Vocational Education
Ohio State University
Center for Vocational Education
1960 Kenny Road
Columbus, Ohio 43210
Telephone: (614) 486-3655

ERIC Clearinghouse on Counseling and Personnel Services
University of Michigan
School of Education Building, Room 2108
Ann Arbor, Michigan 48109
Telephone: (313) 764-9492

ERIC Clearinghouse on Educational Management
University of Oregon
Eugene, Oregon 97403
Telephone: (503) 686-5043

ERIC Clearinghouse on Elementary and Early Childhood Education
University of Illinois
College of Education
Urbana, Illinois 61801
Telephone: (217) 333-1386

ERIC Clearinghouse on Handicapped and Gifted Children
Council for Exceptional Children
1920 Association Drive
Reston, Virginia 22091
Telephone: (703) 620-3660

ERIC Clearinghouse on Higher Education
George Washington University
One Dupont Circle, Suite 630
Washington, D.C. 20036
Telephone: (202) 296-2597

ERIC Clearinghouse on Information Resources
Syracuse University
School of Education
Syracuse, New York 13210
Telephone: (315) 423-3640

ERIC Clearinghouse for Junior Colleges
University of California at Los Angeles
Powell Library, Room 96
Los Angeles, California 90024
Telephone: (213) 825-3931

ERIC Clearinghouse on Languages and Linguistics
Center for Applied Linguistics
1611 North Kent Street
Arlington, Virginia 22209
Telephone: (703) 528-4312

ERIC Clearinghouse on Reading and Communication Skills
National Council of Teachers of English
1111 Kenyon Road
Urbana, Illinois 61801
Telephone: (217) 328-3870

ERIC Clearinghouse on Rural Education and Small Schools
New Mexico State University
Box 3AP
Las Cruces, New Mexico 88003
Telephone: (505) 646-2623

ERIC Clearinghouse for Science, Mathematics, and Environmental Education
Ohio State University
1200 Chambers Road, Third Floor
Columbus, Ohio 43212
Telephone: (614) 422-6717

ERIC Clearinghouse for Social Studies/Social Science Education
855 Broadway
Boulder, Colorado 80302
Telephone: (303) 492-8434

ERIC Clearinghouse on Teacher Education
American Association of Colleges for Teacher Education
One Dupont Circle, N.W., Suite 616
Washington, D.C. 20036
Telephone: (202) 293-7280

ERIC Clearinghouse on Tests, Measurement, and Evaluation
Educational Testing Service
Princeton, New Jersey 08541
Telephone: (609) 921-9000 Ext. 2176

Educational Resources Information Center
Central ERIC
National Institute of Education
Washington, D.C. 20208
Telephone: (202) 254-7934

ERIC Clearinghouse on Urban Education
Box 40
Teachers College, Columbia University
Telephone: (212) 678-3437

APPENDIX C

SOURCES OF TREND INFORMATION

1
Trends 2000 - New Challenges, New Needs, New Images: America in Transition (Washington, D.C.: Association of American Colleges, 1979).

2
Washington, D.C. Office of Technology Assessment, United States Congress.

3
Alternative Scenarios of the American Future (New York: Future Directions for a Learning Society, The College Board, 1979).

4
The Exciting 80's: A Kiplinger Forecast for the Next Decade (Washington: Kiplinger Washington Editors, Inc., 1979).

5
Productivity in the Changing World of the 1980's: The Final Report of the National Center for Productivity and the Quality of Working Life (Washington: National Center for Productivity and Quality of Working Life, 1978).

6
Science and Technology: Annual Report to the Congress (Washington, D.C.: National Science Foundation, 1979).

7
Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention (Washington, D.C.: Public Health Service, 1979).

8
The Essential Community: Local Government in the Year 2000 (Washington, D.C.: International City Management Association, 1980).

9
The Global Report to the President of the United States (Washington, D.C.: Superintendent of Documents, U.S. Government Printing Office, 1980).

10
The President's Commission for a National Agenda for the Eighties
The Quality of American Life in the Eighties
The American Economy
Science and Technology
Energy, Natural Resources, and the Environment in the Eighties
Urban America in the Eighties
The Electoral and Democratic Process in the Eighties
Government and the Regulation of Corporate and Individual Decisions
The United States and the World Community
Government and the Advancement of Social Justice
(Washington, D.C.: U.S. Government Printing Office, 1980).

11
American Renewal (Chicago: Time Inc., 1981).

12
"Technology Forecasts and Technology Surveys" 205 South Beverly Drive, Beverly Hills, California 90212.

13
Federal Laboratory Consortium For Technology Transfer, China Lake, California 93555.

14
Futuremics, Inc., 1629 K Street NW, Suite 5129, Washington, D.C. 20006.

15
World Future Society, 4916 St. Elmo Avenue, Washington, D.C. 20014.

16
Technology Transfer Society, NIAC-USC Denney Research Bldg, Los Angeles, CA 90007

1. Trend Analysis Program - American Council of Life Insurance
   Reports:
   1. Aging and the Aged (1973)
   2. The Employee (1973)
   3. The Life Cycle (1974)
   4. The International Scene (1974)
   5. Frontier Technologies: Part One - Science and Health (1975)
   6. Frontier Technologies: Part Two - Information Science (1975)
   7. A Culture In Transformation: Toward A Different Social Ethic (1975)
   8. Transportation (1976)
   9. Changing Residential Patterns and Housing (1976)
   10. Planning (1977)
   11. Death, Dying and Life Extension (1978)
   12. The Changing Nature of Work (1978)
   13. Power and Decisions: Institutions in an Information Era (1979)
   14. Health Care: Three Reports from 2030 A.D. (1980)
   15. The Uncertain Future (1981)

   How Tap Works (Washington, D.C.: American Council of Life Insurance, 1979)

2. Work in America Institute, Scarsdale, N.Y.
   Reports:
   1. Mid-Career Perspective: The Middle-Aged and Older Population
   2. Productivity and the Quality of Working Life
   3. Trends in Product Quality and Worker Attitude
   4. Managerial Productivity
   5. Worker Alienation
   6. Human Resource Accounting
   7. New Patterns of Work
   8. Occupational Stress and Productivity
   9. Redesigning Work: A Strategy for Change
   10. Jobs and the Environment
   11. Changing Attitudes Toward Work
   12. Women In Management
   13. The Implications of Work-Family Relationships For Productivity
   14. Performance Evaluation for Professional Personnel
   15. Managerial Compensation
   16. Productivity Measurement: An Evolving Art
   17. Controlling Absenteeism and Turnover
   18. Impact of New Technology: Manufacturing
   19. Impact of New Technology: Service Industries
   20. Cost-Effective Pension Planning
   21. Innovative Work Practices
   22. Designing Cost-Effective Employee Health Plans
   23. White-Collar Productivity
   24. Sharing the Gains of Productivity

APPENDIX D

RESOURCES FOR PLANNING

[1]J. Stanley Ahmann, Needs Assessment for Program Planning In Vocational Education (Columbus, Ohio: National Center for Research in Vocational Education, 1979).

[2]Frank Armijo et al. Comprehensive Institutional Planning: Studies In Implementation (Boulder, Colorado: National Center for Higher Education Management Systems, 1980).

[3]Ellen Chaffee and Douglas Collier, Strategic Decisionmaking and Organizational Results in Colleges and Universities (Boulder, Colorado: National Center for Higher Education Management Systems, June 1981).

[4]Ellen Cherin and Frank Armijo, Supplement to the Handbook for Institutional Academic and Program Planning (Boulder, Colorado: National Center for Higher Education Management Systems, 1980).

[5]Douglas J. Collier, The Strategic Planning Concept (Boulder, Colorado: National Center for Higher Education Management Systems, 1981).

[6]Robert G. Cope, Strategic Policy Planning: A Guide for College and University Administrators (Littleton, Colorado: The Ireland Corporation, 1978).

[7]Robert G. Cope, Strategic Planning, Management and Decisionmaking (Washington, D.C.: American Association of Higher Education, 1981).

[8]Raymond N. Kieft, Frank Armijo, and Neil S. Bucklew, A Handbook for Institutional Academic and Program Planning: From Idea to Implementation (Boulder, Colorado: National Center for Higher Education Management System, 1978).

[9]Raymond N. Kieft, Academic Planning: Four Institutional Case Studies (Boulder, Colorado: National Center for Higher Education Management System, 1978).

[10]Gunder A. Myran and Douglas Kelley, Strategic Planning and the Future of Community Colleges (Ann Arbor, Mich.: A Cooperative for the Advancement of Community-Based Postsecondary Education, 1982).

[11]Robert C. Shirley and J. Kent Caruthers, "Strategic Planning for Higher Education," presented at the annual meeting of the American Association of State Colleges and Universities, November 20, 1979.

[12]Harold Stan et al., Selecting, Analyzing, and Displaying Planning Information (Columbus, Ohio: The National Center for Research in Vocational Education, 1979).

[13]Mantha Vlahos, "Needs Assessment," Journal of the American Technical Education Association, Inc., July-August, 1978.

APPENDIX E

RESOURCES ON OUTCOMES

[1]J. Frank Armijo, Sidney S. Micek, and Edward M. Cooper, Conducting Community-Impact Studies: A Handbook for Community Colleges (Boulder, Colorado: National Center for Higher Education Management Systems, 1978).

[2]Raymond Bess, Ivan J. Lash, and Fred L. Wellman, A Study of the Economic Inpact of Six Community Colleges in Illinois (Illinois Community College Board, March, 1980).

[3]Kathleen A. Bolland, Vocational Education Outcomes: An Evaluative Bibliography of Empirical Studies (Columbus, Ohio: The National Center for Research in Vocational Education, 1979).

[4]John Caffrey and Herbert H. Isaacs, Estimating the Impact of a College or University on the Local Economy (Washington, D.C.: American Council on Education, 1971).

[5]Robert L. Darcy, Vocational Education Outcomes: Prospective for Evaluation (Columbus, Ohio: The National Center for Research in Vocational Education, 1979).

[6]Joanne Farley, Vocational Education Outcomes: A Thesaurus of Outcome Questions (Columbus, Ohio: The National Center for Research in Vocational Education,1979).

[7]Sally Jackson, Christy Wales, and Gerald Monti, Washington State Community Colleges: Impact on the Economy of the State (Seattle: Washington State Board for Community College Education, June, 1978).

[8]Oscar T. Lenning, Previous Attempts to Structure Educational Outcomes and Outcome-Related Concepts: A Compilation and Review of the Literature (Boulder, Colorado: National Center for Higher Education Management Systems, 1977).

[9]Oscar T. Lenning et al., A Structure for the Outcomes of Postsecondary Education (Boulder, Colorado: National Center for Higher Education Management Systems, 1977).

[10]Oscar T. Lenning, The Outcomes Structure: An Overview and Procedures for Applying It In Postsecondary Education Institutions (Boulder, Colorado: National Center for Higher Education Management systems, 1977).

[11]Sidney S. Micek and William Ray Arney, Outcome-Oriented Planning in Higher Education: An Approach on an Impossibility? (Boulder, Colorado: National Center for Higher Education Management Systems at Western Interstate Commission for Higher Education, 1973).

[12]Carolyn M. Taylor, Robert L. Davey, and Kathleen A. Bolland, Vocational Education Outcomes: Associated Bibliography of Related Literature (Columbus, Ohio: The National Center for Research in Vocational Education, 1979).

APPENDIX F

Titles of the National Center's Performance-Based Teacher Education Modules

Category A: Program Planning, Development, and Evaluation

- A-1 Prepare for a Community Survey
- A-2 Conduct a Community Survey
- A-3 Report the Findings of a Community Survey
- A-4 Organize an Occupational Advisory Committee
- A-5 Maintain an Occupational Advisory Committee
- A-6 Develop Program Goals and Objectives
- A-7 Conduct an Occupational Analysis
- A-8 Develop a Course of Study
- A-9 Develop Long-Range Program Plans
- A-10 Conduct a Student Follow-Up Study
- A-11 Evaluate Your Vocational Program

Category B: Instructional Planning

- B-1 Determine Needs and Interests of Students
- B-2 Develop Student Performance Objectives
- B-3 Develop a Unit of Instruction
- B-4 Develop a Lesson Plan
- B-5 Select Student Instructional Materials
- B-6 Prepare Teacher-Made Instructional Materials

Category C: Instructional Execution

- C-1 Direct Field Trips
- C-2 Conduct Group Discussions, Panel Discussions, and Symposiums
- C-3 Employ Brainstorming, Buzz Group, and Question Box Techniques
- C-4 Direct Students in Instructing Other Students
- C-5 Employ Simulation Techniques
- C-6 Guide Student Study
- C-7 Direct Student Laboratory Experience
- C-8 Direct Students in Applying Problem-Solving Techniques
- C-9 Employ the Project Method
- C-10 Introduce a Lesson
- C-11 Summarize a Lesson
- C-12 Employ Oral Questioning Techniques
- C-13 Employ Reinforcement Techniques
- C-14 Provide Instruction for Slower and More Capable Learners
- C-15 Present an Illustrated Talk
- C-16 Demonstrate a Manipulative Skill
- C-17 Demonstrate a Concept or Principle
- C-18 Individualize Instruction
- C-19 Employ the Team Teaching Approach
- C-20 Use Subject Matter Experts to Present Information
- C-21 Prepare Bulletin Boards and Exhibits
- C-22 Present Information with Models, Real Objects, and Flannel Boards
- C-23 Present Information with Overhead and Opaque Materials
- C-24 Present Information with Filmstrips and Slides
- C-25 Present Information with Films
- C-26 Present Information with Audio Recordings
- C-27 Present Information with Televised and Videotaped Materials
- C-28 Employ Programmed Instruction
- C-29 Present Information with the Chalkboard and Flip Chart
- C-30 Provide for Students' Learning Styles

Category D: Instructional Evaluation

- D-1 Establish Student Performance Criteria
- D-2 Assess Student Performance: Knowledge
- D-3 Assess Student Performance: Attitudes
- D-4 Assess Student Performance: Skills
- D-5 Determine Student Grades
- D-6 Evaluate Your Instructional Effectiveness

Category E: Instructional Management

- E-1 Project Instructional Resource Needs
- E-2 Manage Your Budgeting and Reporting Responsibilities
- E-3 Arrange for Improvement of Your Vocational Facilities
- E-4 Maintain a Filing System
- E-5 Provide for Student Safety
- E-6 Provide for the First Aid Needs of Students
- E-7 Assist Students in Developing Self-Discipline
- E-8 Organize the Vocational Laboratory
- E-9 Manage the Vocational Laboratory
- E-10 Combat Problems of Student Chemical Use

Category F: Guidance

- F-1 Gather Student Data Using Formal Data-Collection Techniques
- F-2 Gather Student Data Through Personal Contacts
- F-3 Use Conferences to Help Meet Student Needs
- F-4 Provide Information on Educational and Career Opportunities
- F-5 Assist Students in Applying for Employment or Further Education

Category G: School–Community Relations

- G-1 Develop a School–Community Relations Plan for Your Vocational Program
- G-2 Give Presentations to Promote Your Vocational Program
- G-3 Develop Brochures to Promote Your Vocational Program
- G-4 Prepare Displays to Promote Your Vocational Program
- G-5 Prepare News Releases and Articles Concerning Your Vocational Program
- G-6 Arrange for Television and Radio Presentations Concerning Your Vocational Program
- G-7 Conduct an Open House
- G-8 Work with Members of the Community
- G-9 Work with State and Local Educators
- G-10 Obtain Feedback about Your Vocational Program

Category H: Vocational Student Organization

- H-1 Develop a Personal Philosophy Concerning Vocational Student Organizations
- H-2 Establish a Vocational Student Organization
- H-3 Prepare Vocational Student Organization Members for Leadership Roles
- H-4 Assist Vocational Student Organization Members in Developing and Financing a Yearly Program of Activities
- H-5 Supervise Activities of the Vocational Student Organization
- H-6 Guide Participation in Vocational Student Organization Contests

Category I: Professional Role and Development

- I-1 Keep Up to Date Professionally
- I-2 Serve Your Teaching Profession
- I-3 Develop an Active Personal Philosophy of Education
- I-4 Serve the School and Community
- I-5 Obtain a Suitable Teaching Position
- I-6 Provide Laboratory Experiences for Prospective Teachers
- I-7 Plan the Student Teaching Experience
- I-8 Supervise Student Teachers

Category J: Coordination of Cooperative Education

- J-1 Establish Guidelines for Your Cooperative Vocational Program
- J-2 Manage the Attendance, Transfers, and Terminations of Co-Op Students
- J-3 Enroll Students in Your Co-Op Program
- J-4 Secure Training Stations for Your Co-Op Program
- J-5 Place Co-Op Students on the Job
- J-6 Develop the Training Ability of On-the-Job Instructors
- J-7 Coordinate On-the-Job Instruction
- J-8 Evaluate Co-Op Students' On-the-Job Performance
- J-9 Prepare for Students' Related Instruction
- J-10 Supervise an Employer–Employee Appreciation Event

New! Category K: Implementing Competency-Based Education (CBE)

- K-1 Prepare Yourself for CBE
- K-2 Organize the Content for a CBE Program
- K-3 Organize Your Class and Lab to Install CBE
- K-4 Provide Instructional Materials for CBE
- K-5 Manage the Daily Routines of Your CBE Program
- K-6 Guide Your Students Through the CBE Program

New! Category L: Serving Students with Special/Exceptional Needs

- L-1 Prepare Yourself to Serve Exceptional Students
- L-2 Identify and Diagnose Exceptional Students
- L-3 Plan Instruction for Exceptional Students
- L-4 Provide Appropriate Instructional Materials for Exceptional Students
- L-5 Modify the Learning Environment for Exceptional Students
- L-6 Promote Peer Acceptance of Exceptional Students
- L-7 Use Instructional Techniques to Meet the Needs of Exceptional Students
- L-8 Improve Your Communication Skills
- L-9 Assess the Progress of Exceptional Students
- L-10 Counsel Exceptional Students with Personal–Social Problems
- L-11 Assist Exceptional Students in Developing Career Planning Skills
- L-12 Prepare Exceptional Students for Employability
- L-13 Promote Your Vocational Program with Exceptional Students

New! Category M: Assisting Students in Improving Their Basic Skills

- M-1 Assist Students in Achieving Basic Reading Skills
- M-2 Assist Students in Developing Technical Reading Skills
- M-3 Assist Students in Improving Their Writing Skills
- M-4 Assist Students in Improving Their Oral Communication Skills
- M-5 Assist Students in Improving Their Math Skills
- M-6 Assist Students in Improving Their Survival Skills

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